

Appendix A: Ribbon filament lamp sample calibration report

In reply refer to: 844/[123456-95](#)

[Radiometric Systems Inc.](#)

Attn: [John Doe](#)

[123 Calibration Court](#)

[Measurement City, MD 00000-0000](#)

Subject: Ribbon Filament Lamp Report of Calibration

Order No.: [AB1234](#) dated [January 1, 1995](#)

Dear [Mr. Doe](#):

Enclosed are results of the [calibration](#) you requested for Test Number 35050C Radiance Temperature Standard, Ribbon Filament Lamp. Please refer to the above file [number](#) in any further communication concerning [this calibration](#).

Sincerely,

Albert C. Parr, Chief
Optical Technology Division
Physics Laboratory

Enclosures:

[One Report](#) of Calibration

ACP/jah

NIST Cost Center 8443600

REPORT OF CALIBRATION

35050C Radiance Temperature Standard,
Ribbon Filament Lamp

for

Model # General Electric 30A/T24/6, Serial # P000

Submitted by:

John Doe
Radiometric Systems Inc.
123 Calibration Court
Measurement City, MD 00000-0000

(See your Purchase Order No. AB1234 dated January 1, 1995)

1. Description of Calibration Item

A gas-filled tungsten ribbon filament lamp with a mogul screw base was calibrated by the National Institute of Standards and Technology (NIST) as a standard of radiance temperature from 1000 EC to 2200 EC. The serial number is located on the rear of the lamp envelope opposite the side viewed by the pyrometer.

2. Description of Calibration

The lamp was calibrated in the NIST Radiance Temperature Calibration Facility using the equipment and procedures described in Ref. [1]. The NIST Photoelectric Pyrometer, which has a mean effective wavelength of 655.3 nm, was used to spectrally compare the test lamp to working standard SL20 to determine its radiance temperature at each test lamp current. The NIST Photoelectric Pyrometer is described in the Ref. [1].

The orientation and operation of the test lamp is described in the enclosed NIST SP250-43 entitled, "Radiance Temperature Calibrations." The calibration was performed with the lamp operating on direct current and with the center contact of the lamp base at positive potential. The lamp was aligned base down while operating at a radiance temperature of 1700 EC.

Laboratory Environment:

Temperature: 24 EC " 1 EC

Relative Humidity: 25% " 5%

Calibration Date: January 2, 1995

NIST Test No.: 844/123456-95

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REPORT OF CALIBRATION

35050C Radiance Temperature Standard, Ribbon Filament Lamp
Radiometric Systems Inc.

Model #: GE 30A/T24/6
Serial #: P000

3. Results of Calibration

Table 1 gives the radiance temperature of the test lamp at 655.3 nm versus the test lamp current.

Table 2 gives the calibration uncertainties in relative to the International System of Units (SI Units). The expanded uncertainties $U = ku_c(T)$ (coverage factor $k = 2$) are two standard deviation estimates. Details on the estimation of these uncertainties are given in Ref. [1]. The NIST policy on uncertainty statements is described in Ref. [3].

4. General Information

The temperatures described in this report are radiance temperatures. The temperatures are stated with respect to the 1990 NIST Radiance Temperature Scale and correspond to temperatures when sighting on a Planckian radiator. See Ref. [2] for further details on the 1990 NIST Radiance Temperature Scale.

To maintain the highest accuracy, keep the lamp envelope clean and have the lamp recalibrated periodically. Appropriate calibration schedules vary with lamp and application and are best determined by the user.

The following was taken from Barber [4]. The radiance temperature below 1500 °C for gas-filled lamps and 900 °C for vacuum lamps will change as the room or ambient temperature changes. Barber observed a change in radiance temperature for a gas-filled lamp of between 0.3 °C and 0.4 °C per 1 °C change in room temperature at 1000 °C and 0.05 °C per 1 °C change in room temperature at 1400 °C. Changes of the same magnitude were observed at 700 °C and 900 °C for a vacuum lamp.

The results of this calibration apply only to the lamp referenced in this report. This report shall not be reproduced, except in full, without the written approval of the Radiance Temperature Measurements Calibration Service.

Prepared by:

Approved by:

Charles E. Gibson
Optical Technology Division
Physics Laboratory
(301) 975-2329

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For the Director,
National Institute of
Standards and Technology
(301) 975-2355

Calibration Date: January 2, 1995
NIST Test No.: 844/123456-95

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35050C Radiance Temperature Standard, Ribbon Filament Lamp
Radiometric Systems Inc.

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References

- [1] C. E. Gibson, B. K. Tsai, and A. C. Parr, "Radiance Temperature Calibrations," *NIST Special Publication* **250-43** (1997).
- [2] K. D. Mielenz, R. D. Saunders, A. C. Parr, and J. J. Hsia, "The 1990 NIST Scales of Thermal Radiometry," *J. Res. Natl. Inst. Stand. Technol.*, **95**, 621-629, (1990).
- [3] B. N. Taylor and C. E. Kuyatt, "Guidelines for Evaluating and Expressing the Uncertainty of the NIST Measurement Results," *NIST Technical Note* **1297** (2nd ed., 1994).
- [4] C. R. Barber, "Factors affecting the reproducibility of brightness of tungsten strip lamps for pyrometry standardization," *J. Sci. Instr.* **23**, 238 (1946).

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35050C Radiance Temperature Standard, Ribbon Filament Lamp
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Model #: GE 30A/T24/6

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TABLE 1
Radiance Temperature of Lamp P000 at 655.3 nm

Radiance Temperature (1990 NIST) [°C]	Lamp Current [A]
1000	12.945
1100	14.220
1200	15.698
1300	17.358
1400	19.191
1500	21.155
1600	23.246
1700	25.449
1800	27.757
1900	30.175
2000	32.669
2100	35.254
2200	37.922

REPORT OF CALIBRATION

35050C Radiance Temperature Standard, Ribbon Filament Lamp
Radiometric Systems Inc.

Model #: **GE 30A/T24/6**
Serial #: **P000**

TABLE 2
Radiance Temperature Calibration Uncertainties

Source of Uncertainty	Type	Expanded Uncertainties ($k = 2$) [°C]				
		800 °C	1100 °C	1500 °C	1900 °C	2300 °C
1. Calibration of the reference radiance temperature lamp relative to the 1990 NIST Radiance Temperature Scale	B	0.12	0.19	0.32	0.48	0.67
2. Test lamp temperature determination	A	0.42	0.17	0.29	0.43	0.60
3. Current measurement	B	0.29	0.19	0.15	0.14	0.14
4. Mean effective wavelength measurement for the NIST Photoelectric Pyrometer	B	0.10	0.04	0.09	0.28	0.54
5. Test lamp alignment	B	0.09	0.14	0.24	0.36	0.51
6. 1990 NIST Radiance Temperature Scale relative to the Thermodynamic Temperature Scale	B	0.15	0.24	0.40	0.61	0.85
Overall uncertainty of test lamp calibration with respect to SI units		0.6	0.4	0.7	1.0	1.5